

# PATENT SPECIFICATION

(11) 1 583 309

1 583 309

- (21) Application No. 16174/78 (22) Filed 25 April 1978  
 (23) Complete Specification filed 30 May 1978  
 (44) Complete Specification published 21 Jan. 1981  
 (51) INT CL<sup>3</sup> F26B 13/20  
 (52) Index at acceptance F4G 11A 18F 18J  
 (72) Inventor HENRY WINSTON LOVEDAY



## (54) IMPROVEMENTS IN DRYING MACHINES FOR PAPER WEB

(71) We, GREENBANK CAST BASALT ENGINEERING CO. LIMITED, of Gate Street, Blackburn, County of Lancaster, a British Company; do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in drying machines for paper web and similar machines.

Various drying systems have been suggested to replace cylinders. In one form airfoil nozzles are employed in which a high air velocity between the nozzle surface and the web creates a low static pressure in the section in accordance with Bernoulli's principle which states that in a flow system the sum of dynamic pressure and static pressure remains constant. The result of the low air pressure is that the web is drawn somewhat from the original position to the nozzle surface until an equilibrium between web tension and air-flow is created. The resultant small gap between the web and nozzle surface is so stable that there is a carrying force of some kilograms per running metre of nozzle length. Flow conditions in the gap zone are important for the heat and mass transfer. The air flow at the nozzle exit gap is substantially laminar due to the acceleration. The directional change on the nozzle radius of about 70° known as the Coanda effect produces a certain energy loss in the boundary layer which is expressed by an increased thickness of the layer. In the gap between the web and nozzle surface, the air flow changes completely from laminar into turbulent which improves the heat transfer from the drying air onto the web and additionally the air is heated by the hot nozzle surface.

The object of the invention is the provision of an air float type dryer based on the Coanda effect whereby directing the air flow along the surface of the nozzle, the web being dried is attracted towards the moving air, thereby creating a highly turbulent zone between the

web and nozzle which results in a rate of evaporation much higher than the normal high velocity dryer.

According to the invention a drying machine for paper webs in which a web to be dried passes over a chamber forming a pressure zone supplied with compressed air, the chamber being formed with an opening in the top with the sides of the opening being extended inwardly to form flanges extending the length of the chamber transversely of the web, a pair of curved deflecting separated plates extending between the flanges to direct air from the chamber in two opposed streams, a third stream passing up between the plates to impinge upon the underside of the web to form a cushion effect between the two outer streams.

The invention will be described with reference to the accompanying drawing showing a diagrammatic longitudinal section through the drying machine.

A paper web A travels over a chamber 1 forming a pressure zone supplied with compressed air, the chamber 1 being formed with an opening or gap extending transversely of the web. The sides 2 of the opening or gap extend inwardly of the chamber with two curved plates 3 mounted symmetrically of the opening or gap in the chamber and secured in position by bolts 4 passing through the flanges 2 and the plates 3. The plates 3 are separated and extend outwardly through the opening or gap, each plate 3 converging towards the adjacent outlet through the opening or gap to provide a passage for two streams of air 5 onto the underside of the web A flowing in opposite directions substantially parallel with the web.

A third stream of air 6 is passed upwards between the two plates to impinge on the underside of the web A which fans outwardly and divides to flow towards both of the first two streams, the third stream being finer than the first two streams to form a cushion effect between the first two streams thus protecting the tips of the plates, which form nozzles, against contamination from the web.

The damp air passes to two return zone compartments 7 one at each side of the pressure zone 1.

5 The gap between the top of the chamber 1 and the paper web is preferably 1 to 1.5 mm.

WHAT WE CLAIM IS:—

- 10 1. A drying machine for paper webs in which the web to be dried passes over a chamber forming a pressure zone supplied with compressed air, the chamber being formed with an opening in the top with the sides of the opening being extended inwardly to form flanges extending the length of the chamber transversely of the web, a pair of  
15 curved deflecting separated plates extending between the flanges to direct air from the chamber in two opposed streams, a third stream passing up between the plates to im-

pinge upon the underside of the web to form a cushion effect between the two outer streams. 20

2. A drying machine for paper webs as in Claim 1 in which each plate being curved outwardly to direct the streams through the opening or gap to provide two streams of air directed in opposite directions onto the under- side of the web, substantially parallel to the web. 25

3. A drying machine for paper webs substantially as described with reference to the accompanying drawings. 30

J. OWDEN O'BRIEN & SON,  
Chartered Patent Agents,  
Manchester, M2 4LQ.

1583309

COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

